

What is claimed is:

~~CLAIMS~~

~~1. A process for forming a phosphate conversion coating on a metal substrate surface, said process comprising the following operations:~~

~~(I) contacting the metal substrate surface with an aqueous liquid surface conditioning composition that comprises, preferably consists essentially of, or more preferably consists of, water and the following components:~~

~~(I.A) dispersed solid phosphate particles that:~~

- ~~(i) have a diameter no greater than 5 μm ; and~~
~~(ii) comprise at least one substance selected from the group consisting of phosphates that contain at least one type of divalent or trivalent metal cations;~~

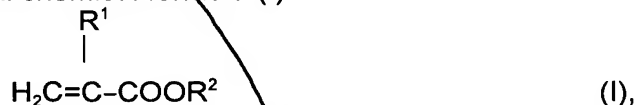
and

~~(I.B) as adhesion-promoting component, at least one selection from the group consisting of the following subgroups:~~

- ~~(1) monosaccharides, polysaccharides, and derivatives thereof;~~
~~(2) phosphorus containing solutes selected from the group consisting of orthophosphoric acid, condensed phosphoric acids, and organophosphonic acid compounds;~~
~~(3) water-soluble polymers that are homopolymers or copolymers of vinyl acetate and derivatives of these homopolymers and copolymers; and~~
~~(4) copolymers and polymers afforded by the polymerization of:~~

~~(a) at least one selection from:~~

~~-- monomers, exclusive of vinyl acetate, that conform to general chemical formula (I):~~



~~where $\text{R}^1 = \text{H}$ or CH_3 and $\text{R}^2 = \text{H}$, C_1 to C_5 alkyl, or C_1 to C_5 hydroxyalkyl; and~~

~~-- other α,β -unsaturated carboxylic acid monomers; and, optionally,~~

~~(b) not more than 50 % by weight of monomers that are not vinyl acetate and are not within the description of part (a) immediately above but are copolymerizable with said monomers that are~~

within the description of said part (a);

and

(II) contacting the metal substrate surface as conditioned in operation (I) as described above with a nickel-free phosphate conversion treatment bath that comprises water and the following amounts of the following components:

- (II.A) from 0.5 to 5 g/l of zinc cations;
- (II.B) from 5 to 30 g/l of phosphate ions; and
- (II.C) a component of conversion accelerator.

2. A process according to claim 1, wherein the phosphate conversion treatment bath also contains from 0.1 to 3.0 g/l of at least one type of ions selected from the group consisting of magnesium ions, cobalt ions, manganese ions, calcium ions, tungstate ions, and strontium ions.

3. A process according to claim 2, wherein the concentration of component (I.A) is from 0.001 to 30 g/l and the concentration of component (I.B) is from 1 to 2,000 ppm.

4. A process according to claim 1, wherein the concentration of component (I.A) is from 0.001 to 30 g/l and the concentration of component (I.B) is from 1 to 2,000 ppm.

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